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(54) Title: A METAL PARTICLE, ITS PREPARATION AND USE, AND A MATERIAL OR DEVICE COMPRISING THE METAL PARTICLE

(57) Abstract

A metal particle comprising a metal core and a silane shell, wherein said core comprises a metal selected from the group consisting of gold, silver, platinum, palladium, rhodium, ruthenium, osmium, iridium and combinations thereof, and said shell comprises a mercaptosilane residue bound to said metal core. The silane shell may be surrounded by a further shell, which comprises a silicate, titanate, zirconate, aluminate, borate or, preferably, silane residue. The residues in this further shell may be cross–linked with each other. The particle may be a colloidal particle, and its size may be 5 nm or lower, such as 0.8 to 1.5 nm. The particle may carry a covalently attached foreign molecule. A method for preparing the particle, a material or device comprising the particle embedded in a matrix or carried on a support, and various uses of the particle.

CLAIMS

1. A metal particle comprising a metal core and a silane shell, wherein said core comprises a metal selected from the group consisting of gold, silver, platinum, palladium, rhodium, ruthenium, osmium, iridium and combinations thereof, and said shell comprises a mercaptosilane residue bound to said metal core.

2. The metal particle of claim 1, wherein said mercaptosilane residue is derived from a mercaptosilane compound of the formula $HS-(CH_2)_m-Si(OR^1)_nR^2_{3-n}$, wherein m and n both are integers, $m \geq 0$, $0 \leq n \leq 3$, each R^1 independent from any further R^1's is a member of the group consisting of hydrogen, alkyl and trialkylsilyl, and each R^2 independent from any further R^2's is a member of the group consisting of alkyl, haloalkyl, phenyl and halogen.

3. The metal particle of claim 2, wherein

--- $0 \leq m \leq 18$, preferably $1 \leq m \leq 6$, most preferably $m = 3$,

--- $0 \leq n \leq 3$, preferably $1 \leq n \leq 3$,

--- R^1 is hydrogen, C_1-C_6 alkyl, preferably C_1-C_4 alkyl, most preferably methyl or ethyl, or C_1-C_4 trialkylsilyl, most preferably trimethylsilyl, and

--- R^2 is C_1-C_{18} alkyl, preferably C_1-C_6 alkyl, halo(C_1-C_{18})-alkyl, preferably halo(C_1-C_6)alkyl, phenyl, or halogen, wherein halo(gen) is selected from the group consisting of F, Cl, Br and I.

4. The metal particle of any one of claims 1 to 3, which has a size of 5 nm or lower, preferably a size in the range of from about 0.8 nm to about 1.5 nm.

5. The metal particle of any one of claims 1 to 4, wherein mercaptosilane residues in said shell are cross-linked with each other.

6. The metal particle of any one of claims 1 to 5, wherein said silane shell is surrounded by a further shell, said